

IN THE CLAIMS

Per the revised amendment practice, a complete listing of all claims in the application follows.

1. (Original) A method of establishing electrical communication between a first device and a second device in a semiconductor circuit, comprising:

contacting said first device with a first end of an electrically conductive material;

layering an initial barrier component over a second end of said electrically conductive material;

nitridizing at least a portion of said initial barrier component; and

contacting said second device with said portion of said initial barrier component.

2. (Original) The method in claim 1, further comprising a step of siliciding at least a second portion said initial barrier component.

3. (Original) The method in claim 2, wherein said step of contacting said first device further comprises contacting a transistor with doped silicon; and wherein said step of contacting said second device further comprises contacting a capacitor.

4. (Original) The method in claim 3, wherein said step of contacting said second device further comprises contacting a capacitor with a doped polysilicon plug.

5. (Original) A method of processing a semiconductor circuit on a substrate covered with an insulating layer, wherein said layer defines an opening over said substrate, and polysilicon contacts a surface of said substrate and a bottom of said opening; and wherein said method comprises:

providing an initial barrier component on at least said polysilicon; and
nitridizing said initial barrier component.

6. (Original) The method in claim 5, further comprising siliciding said initial barrier component.

7. (Original) The method in claim 6, further comprising a step of providing an oxidation protection layer within said opening.

8. (Original) The method in claim 7, further comprising a step of recessing said polysilicon.

9. (Original) The method in claim 8, wherein said step of providing an initial barrier component further comprises providing said initial barrier component only on said polysilicon.

10. (Original) The method in claim 9, wherein said step of providing said initial barrier component comprises depositing said initial barrier component through selective chemical vapor deposition.

11. (Previously presented) The method in claim 8, wherein said step of providing said initial barrier component further comprises the steps of:

depositing said initial barrier component on said polysilicon and within said opening; and
etching said initial barrier component within said opening.

12. (Original) A method of preparing a semiconductor device comprising a container defined by at least one insulation layer, comprising:

forming a poly plug extending toward said container and having a surface under said container;
depositing an initial barrier component at least between said poly plug and said container; and
nitridizing a first portion of said initial barrier component, wherein said first portion is next to said container.

13. (Original) The method in claim 12, further comprising a step of siliciding a second portion of said initial barrier component, wherein said second portion is between said poly plug and said first portion of said initial barrier component.

14. (Original) The method in claim 13, further comprising a step of depositing an oxidation protection layer within said container and over said first portion.

15. (Original) The method in claim 14, wherein said step of depositing an initial barrier component further comprises lining said container with said initial barrier component; and wherein said step of nitridizing a first portion of said initial barrier component further comprises nitridizing said initial barrier component lining said container.

16. (Original) A method of forming an interface between a transistor and a capacitor, wherein said transistor includes a doped portion of a substrate, and an in-process poly plug is supported by said doped portion and extends upward along a length to a capacitor site, and wherein said method comprises:

reducing said poly plug to generally half of said length;
selectively chemically vapor depositing a barrier component onto said poly plug,
wherein said barrier component has a bottom next to said poly plug and a top
opposite from said bottom; and
nitridizing said top of said barrier component.

17. (Original) The method in claim 16, wherein said step of nitridizing further comprises nitridizing generally half of said barrier component.

18. (Original) The method in claim 17, further comprising a step of siliciding said bottom of said barrier component.

19. (Original) The method in claim 18, wherein said step of siliciding further comprises siliciding generally half of said barrier component.

20. (Previously presented) A method of interfacing a silicon contact with a semiconductor device, comprising:

forming a barrier to diffusion from said silicon contact using a first material layered

over said silicon contact; and
forming a barrier to oxidation of said silicon contact using a selection of said first material and a second material, wherein said barrier to oxidation is discrete from said semiconductor device.

21. (Original) The method in claim 20, wherein said step of forming a barrier to oxidation further comprises providing a layer of ruthenium oxide.

22. (Original) The method in claim 20, wherein said step of forming a barrier to diffusion further comprises layering over said silicon contact a selection of platinum, iridium, osmium, palladium, rhodium, ruthenium, and oxides thereof; and wherein said step of forming a barrier to oxidation further comprises forming a barrier to oxidation using said selection.

23. (Previously presented) The method in claim 20, wherein said step of forming a barrier to diffusion further comprises providing a metal nitride layer; and wherein said step of forming a barrier to oxidation further comprises providing a layer consisting of a selection of a metal or a metal oxide.

24. (Original) The method in claim 23, wherein:
said step of forming a barrier to diffusion further comprises providing a first layer selected from:

- a nitride of titanium, tungsten, rhenium, and platinum-group metals,
- an oxide of said platinum-group metals,
- an alloy of said platinum-group metals, and
- a boride of a transition metal; and

said step of forming a barrier to oxidation further comprises providing a second layer over said first layer, wherein said second layer is selected from platinum-group metals and an oxide of platinum-group metals.

25. (Previously presented) A method of establishing electrical contact between a semiconductor substrate and a semiconductor device, comprising:

covering said substrate with an insulating layer;
etching a hole through said insulating layer to said substrate;
partially plugging said hole with doped polycrystalline silicon;
selectively depositing at least one metal layer within said hole over said doped
polycrystalline silicon;
nitridizing said at least one metal layer;
siliciding said at least one metal layer; and
forming said semiconductor device over said at least one metal layer.

26. (Original) The method in claim 25, wherein:

said step of depositing at least one metal layer comprises depositing a titanium
layer;
said step of nitridizing said at least one metal layer comprises nitridizing said
titanium layer; and
said step of siliciding said at least one metal layer comprises siliciding said titanium
layer.

27. (Previously presented) A method of establishing electrical contact between a semiconductor
substrate and a semiconductor device, comprising:

covering said substrate with an insulating layer;
etching a hole through said insulating layer to said substrate;
partially plugging said hole with doped polycrystalline silicon;
depositing at least one metal layer within said hole over said doped polycrystalline
silicon;
siliciding said at least one metal layer, wherein said step of siliciding said at least one
metal layer comprises siliciding a titanium layer;
nitridizing said at least one metal layer, wherein said step of nitridizing said at least one
metal layer comprises nitridizing a non-titanium layer; and
forming said semiconductor device over said at least one metal layer, wherein said step
of forming said semiconductor device further comprises forming said
semiconductor device over said non-titanium layer.

Claim 28 (cancelled).

29. (Previously presented) A damascene process, comprising:
- forming a first insulation layer over a semiconductor substrate;
 - forming a first hole in said first insulation layer;
 - forming doped polysilicon in said first hole;
 - selectively depositing a material over said doped polysilicon; and
 - forming a silicon barrier from said material.

30. (Previously presented) The process in claim 29, wherein said step of forming doped polysilicon further comprises forming doped polysilicon having a surface within said first hole that is lower than a top of said first insulation layer.

31. (Previously presented) The process in claim 30, wherein said step of forming doped polysilicon having a surface within said first hole further comprises:

- generally completely filling said first hole with said doped polysilicon; and
- etching a portion of said doped polysilicon.

32. (Original) The process in claim 31, further comprising a step of forming an oxygen barrier over said silicon barrier.

33. (Original) The process in claim 32, further comprising a step of forming an electrical contact enhancement layer under said silicon barrier.

34. (Previously presented) A damascene process, comprising:

- forming a first insulation layer over a semiconductor substrate;
- forming a first hole in said first insulation layer;
- forming doped polysilicon in said first hole, wherein said step of forming doped

polysilicon further comprises forming doped polysilicon having a low surface within said first hole, wherein said step of forming doped polysilicon having a low surface within said first hole further comprises:

generally completely filling said first hole with said doped polysilicon,

and

etching a portion of said doped polysilicon;

forming a silicon barrier over said doped polysilicon;

forming an oxygen barrier over said silicon barrier;

forming an electrical contact enhancement layer under said silicon barrier;

forming a second insulation layer over said first insulation layer; and

forming a second hole in said second insulation layer, wherein said second hole is over said first hole.

35. (Original) The process in claim 34, wherein said step of forming an oxygen barrier further comprises forming an oxygen barrier extending into said second hole.

36. (Previously presented) A method of processing a semiconductor device, comprising:

providing a silicon interconnect material contacting an electrically conductive first portion of said semiconductor device; and

selectively providing an initial barrier component on said interconnect material.

37. (Original) The method in claim 36, wherein said step of providing an initial barrier component further comprises initially protecting said semiconductor device against silicon diffusion.

38. (Original) The method in claim 36, wherein said step of providing an initial barrier component further comprises initially providing a component capable of protecting said semiconductor device against silicon diffusion after further processing.

39. (Previously presented) A method of processing a semiconductor device, comprising:

providing a silicon interconnect material contacting an electrically conductive first

portion of said semiconductor device;
providing an initial barrier component contacting said interconnect material, wherein
said step of providing an initial barrier component further comprises initially
providing a component capable of protecting said semiconductor device against
silicon diffusion after further processing; and
nitridizing said initial barrier component; and wherein said step of initially providing a
component further comprises providing a component capable of protecting said
semiconductor device against silicon diffusion after being nitridized.

40. (Original) A method of preventing at least some diffusion from a conductive material in a semiconductor device, comprising:

surrounding a side of said conductive material with an insulator;
depositing a barrier material onto said conductive material; and
nitridizing said barrier material.

41. (Original) The method in claim 40, wherein said step of depositing a barrier material further comprises depositing said barrier material onto said conductive material and onto said insulator.

42. (Original) The method in claim 41, further comprising a step of removing said barrier material from said insulator.

43. (Previously presented) A method of treating a silicon contact, comprising:

depositing a barrier component selectively onto said silicon contact; and
nitridizing said barrier component.

44. (Original) The method in claim 43, wherein said step of depositing a barrier component further comprises siliciding said barrier component.

45. (Previously presented) A method of treating a silicon contact, comprising:

depositing a barrier component onto said silicon contact;
nitridizing said barrier component; and

discretely siliciding said barrier component.

46. (Original) The method in claim 45, wherein said step of discretely siliciding said barrier component further comprises siliciding at least an un-nitridized portion of said barrier component.

47. (Original) The method in claim 46, wherein said step of discretely siliciding said barrier component further comprises reacting said barrier component with silicon in said silicon contact.

48. (Previously presented) The method in claim 47, wherein said step of reacting said barrier component further comprises reacting said barrier component with a portion of said silicon contact containing at least one oxygen atom.

Claims 49-72. (Cancelled)